

## Our 3<sup>rd</sup> month! Electrical code issues and answers.

### ● Working clearances for transformers

For the purpose of determining access and working space about transformers, they shall not be required to be considered as “*equipment likely to require examination, adjustment, servicing, or maintenance while energized*”. What is the minimum working clearance? We will not attempt to set an arbitrary distance as a minimum. Adequate clearance to access, repair, or service transformer conductor terminations or taps will be subject to the judgement of the electrical inspector and be based upon transformer size and location and conductor size and location.

If you have any doubt, working clearances in compliance with NEC 110-16, 110-32, and 110-34 will always be considered adequate; otherwise check with your electrical inspector. Transformers shall not be permitted to infringe into the working space required about other equipment or into the dedicated spaces described in NEC 384-4.

### ● Single conductors installed in cable trays

NEC 318-3(b)(1) states that single conductors installed in cable trays shall be No. 1/0 or larger and shall be of a type listed and marked on the surface for use in cable trays. Where exposed to the direct rays of the sun, cables shall be marked as being sunlight resistant. Single conductors used as equipment grounding conductors are not required to be of a type marked for cable tray use. However, they must be No. 4 or larger and are permitted to be insulated, covered, or bare.

### ● Receptacles in dwelling unit laundry rooms and laundry areas

In dwelling units at least one receptacle outlet is required to be installed for the laundry. NEC 210-52(f) allows exceptions to the required outlet for apartment buildings where laundry facilities are provided and accessible to all occupants and for apartment buildings where laundry facilities are not to be installed or permitted.

NEC 220-4 requires at least one “*20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s)*” and the “*circuit shall have no other outlets.*” The outlets are not restricted to supplying only a clothes washing machine. Other receptacles in the laundry room (or area) on the required circuit may be used to serve ironing or other cord-and-plug connected laundry equipment. The total load on a laundry branch circuit must comply with NEC 210-23(a), and for the purposes of this article, clothes washing machines and gas dryers shall be considered as “*utilization equipment fastened in place*” and not as portable equipment. If of proper ratings, a washing machine and gas dryer could be supplied by the same laundry branch circuit. However, it is unlikely that their combined load would be 50 percent (10 amps) or less of the branch circuit rating and permit any additional laundry area receptacles on the same circuit.

### ● Disconnecting means requirements for outside branch circuits and feeders between buildings or structures (includes generators installed outside buildings)

NEC 225-8(b) states “*Where more than one building or other structure is on the same property and under single management, each building or other structure served shall be provided with means for disconnecting all ungrounded conductors. The disconnecting means shall be installed inside or outside of the building or structure served at a readily accessible location nearest the point of entrance of the supply conductors.*” WAC 296-46-225 further defines “nearest the point of entrance” by stating that “*the branch circuit or feeder raceway or cable shall extend no more than 15 feet inside a building or structure.*” (Exceptions for large industrial multibuilding complexes, integrated electrical systems in specific industrial environments, and poles used as lighting standards can be found in NEC 225-8(b).)

Additionally, the disconnecting means specified in NEC 225-8(b) “*shall be suitable for use as service equipment.*” This requirement is not intended to imply that the building disconnecting means must be installed as a service. The “suitable for use as service equipment” rating insures that the disconnect enclosure or panel has the built-in

capability of accepting a main bonding jumper to bond the system grounded circuit conductor (neutral) to the equipment grounds and equipment enclosure. If permitted in NEC 250-24, the electrical designer or installer has the option of installing a main bonding jumper at the served building depending upon whether an equipment grounding conductor is run with the feeder conductors.

### ● **Sign transformer secondary circuit ground-fault protection per NEC 600-23**

Although NEC 600-23(b) states that “*Transformers and electronic power supplies shall have secondary ground-fault protection*,” the code requirement preceded the neon transformer and power supply manufacturing industry’s ability to supply a product that complies. Only one listed transformer is available for skeletal tube neon installations at this time, and a second manufacturer is estimating that their product will not be in full production until April or May of this year. In order to cooperate with the electrical distributors and the sign manufacturing and installation industry, the department will not enforce NEC 600-23(b) until January 1, 1999. This should give the industry adequate time to distribute the new equipment and clear existing supplies of transformers and power supplies from the distribution pipeline.

Underwriters Laboratories has not completed the process of adding secondary circuit ground-fault protection to the UL48 standard (Electric Signs). There is a moratorium on the implementation of NEC 600-23(b) requirements in signs now being manufactured and listed. Electrical inspectors will not require that factory-installed sign transformers and power supplies be replaced with units having secondary ground-fault protection. If signs are listed by an electrical products testing laboratory accredited by the department, then factory-installed internal wiring and equipment meeting UL48 will only be inspected in the field for physical damage.

### ● **Additional information on equipotential planes in agricultural buildings**

NEC section 547-8(b) now requires that an equipotential plane be created in concrete floors in animal confinement areas that have electrical equipment or other equipment that is directly connected to the electrical grounding system. **A wire mesh or other conductive elements (reinforcing rods) must be installed in the concrete** and bonded to all adjacent conductive equipment, structures, or surfaces, and this potential plane must be bonded to the grounding electrode system for the building. The bonding conductor must be copper, not smaller than AWG No. 8, utilizing connectors (and associated screws and bolts) of brass, copper, or copper alloy. Before concrete is poured for floors in such livestock buildings, an electrical inspection is required to verify that the proper electrical bonding is in place.

Equipotential planes are necessary in “animal confinement areas” where the livestock are exposed to more than one electrically conductive element, including things like watering units, feeders, metal partitions or stalls, or milking equipment. In such areas the potential for “stray” currents would exist if all of the conductive surfaces were not bonded together. Additionally, a “voltage gradient or voltage ramp” is necessary at entrances and exits to the equipotential plane to reduce the potential for an animal to receive a shock as it steps onto or off the plane. The voltage differential cannot be totally eliminated, but it can be reduced to acceptable levels.

In cases where additions to animal confinement areas are constructed adjacent to existing concrete floors without conductive elements installed, there are two practical methods to retrofit the existing floors with equipotential systems. A conductive mesh can be installed with a poured concrete overlay on the existing floor, or it is possible to grout copper conductors in concrete saw cuts to establish an equipotential plane.

The construction details of new or retrofit installations of equipotential planes or voltage gradients are far beyond the scope of this newsletter. A fine print note to NEC 547-8(b) references:

*Equipotential Planes in Animal Containment Areas*, American Society of Agricultural Engineers (ASAE) EP473-1994.

ASAE, 2950 Niles Road, St. Joseph, MI 49085-9659  
(616) 429-0300, Fax: (616) 429-3852, <http://asae.org/>

The department has also been made aware of another publication:

*Stray Voltage: Guide to Equipotential Plane Installation*, National Rural Electric Cooperative Association, Rural Electric Research, Project Report 86-B, \$5  
NRECA-RER Publications, 1800 Massachusetts Avenue NW, FA-10, Washington, DC 20036  
(202) 857-4845, <http://www.epri.com/NRECA/>

**New Electrical Section Internet Address: [www.wa.gov/lni/electrical](http://www.wa.gov/lni/electrical)**